NGST MISSION ARCHITECTURE IPT
Activity Report for June-October 1997

Pierre Bely

9 October 1997

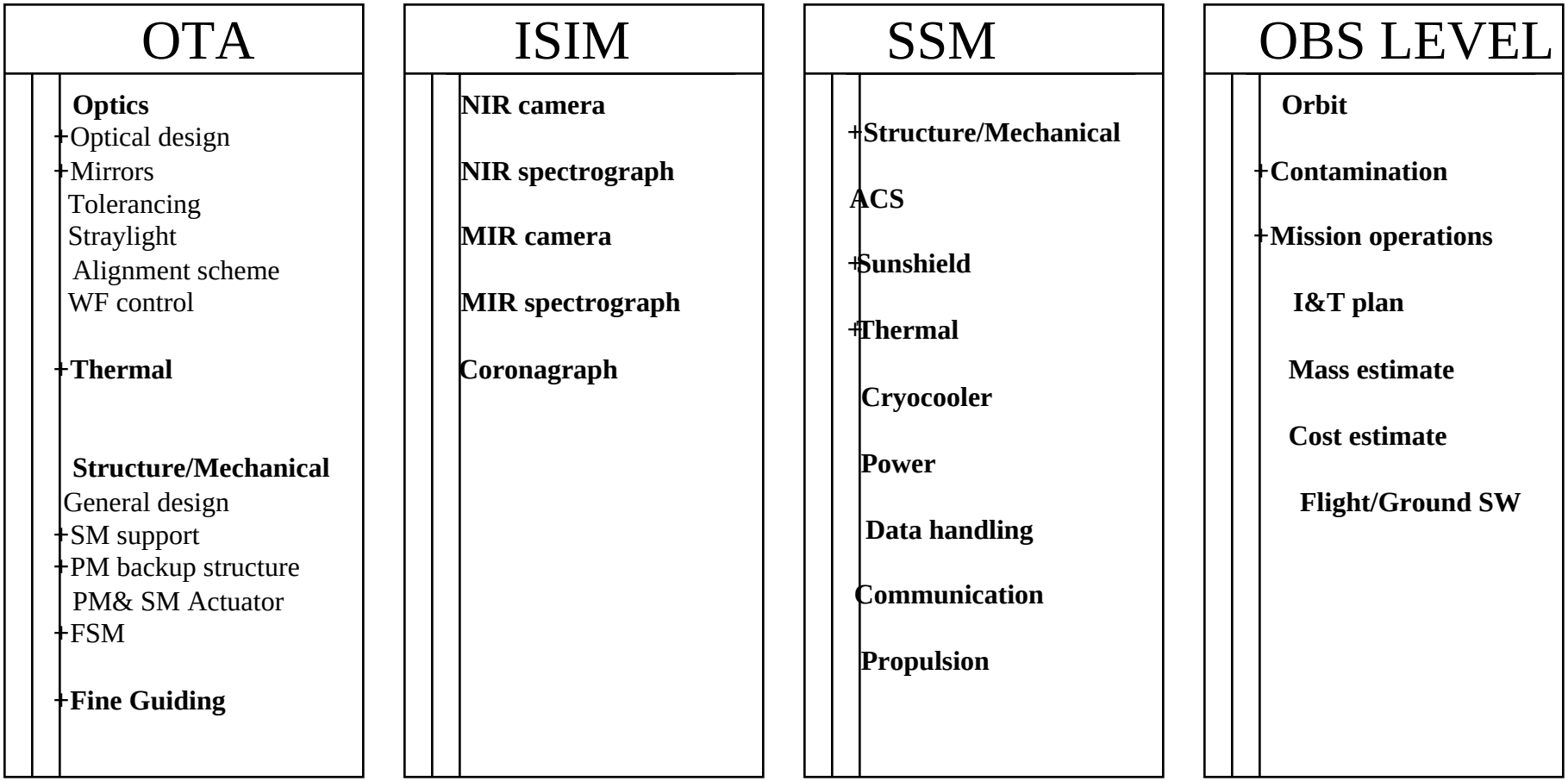
YARDSTICK DESIGN STATUS

- **End-to-end model**
  - Model for the yardstick mission is complete (but several improvements are planned)
  - Two months spent on documentation and clean up
- **Optical design**
  - FSM-induced defocus problem identified by simulation
  - optics being redesigned
- **Sunshield**
  - contamination from sunshield and propulsion was found to be negligible
  - materials investigation for selection of films (structural, thermal, contamination)
- **Thermal analysis**
  - Sunshield thermal trade analysis complete
    - new baseline defined (no V-groove and 6 layers)
    - effect of slews is negligible
  - OTA thermal trade analysis in progress
- **Sparse actuator mirror study**
  - effect of CTE variations
  - feasibility of using actuators to shape mirrors to correct for radius of curvature errors and cte variations

YARDSTICK DESIGN STATUS (Ctd)

- **Tolerances for segmented optics**
- **Alternate OTA subarchitectures**
  - secondary mirror support
  - primary mirror and support
- **ISIM internal study under way**
- **SPIE conference**
  - 12 oral papers (NASA + industry)
  - 7 poster papers
- **Monographs series**

YARDSTICK DESIGN STATUS (Ctd)



Legend: First column: preliminary look (1996); second column: current work

complete or almost complete

\+ started and well under way

PB:17-Oct-97

ISIM INTERNAL STUDY
GOALS

Produce a detailed (Phase A like) study of ISIM to:

- Confirm technical feasibility and cost estimate of the reference design,
- Confirm compatibility with overall NGST concept (OTA, SSM, operations)
- Serve as a rock solid “yardstick” design against which alternate proposals can be compared to,
- Establish corresponding floor science capability
- Serve as fall back designs if more ambitious designs fail to materialize.

ISIM INTERNAL STUDY GUIDELINES

- Instrument suite to include cameras and spectrographs for core science (will include MIR camera and spectrograph but will a-priori exclude additional non core instruments such as a coronograph)
- 9 months effort (must be finished well before Phase A starts (Feb 1999)) with potential extension to 12 months
- Study will be pushed to a level of details sufficient to uncover all potential problems
- But emphasis should be on expanding the work already done, not in creating alternate and potentially better designs (in particular duplication of work done by industry should be avoided)
- Technical approaches must be aggressive but with guaranteed feasibility
  (example: advanced detectors vs DMD)

ISIM INTERNAL STUDY
PI-TEAM AND ADVISORS

A Science Instrument IPT will be re-activated to serve as a non-official advisory group

PI-TEAM

Pierre Bely - STScI - Team Leader
John Mather - GSFC
Richard Burg - JHU
Pete Stockman - STScI
Matt Greenhouse - GSFC
Piero Madau - STScI

LOCAL ADVISORY GROUP:

Eric Smith - GSFC
Pete Shu - GSFC
Rodger Doxsey STScI
Chris Burrows STScI
John MacKenty STScI
Anuradha Koratkar - STScI
Antonella Nota - STScI
Massimo Stiavelli - STScI

EXTERNAL ADVISORY GROUP:

Rodger Thompson U of A
Judy Pipher - U of Rochester
William Forest - U of Rochester
Jacky Fisher - NRL
Dave Redding - JPL
ASWG (for periodic reviews)

NGST MONOGRAPHS

- NGST monographs are intended to
  - document the studies done by the government team
  - communicate findings to industry and astronomical community.
- First series will include:
  - No 1. The NGST yardstick mission (Bely et al)
  - No 2. The Design Reference Mission (Stiavelli, et al)
  - No 3. Considerations on aperture configuration (Bely, Burrows, Stockman))
  - No 4. Considerations on guiding (Bely, Burg)
  - No 5. A simple dynamics model for NGST (Bely, Burg,Mosier, Perrygo)
  - No 6. Straylight analysis (Bely, Mehalick, Petro)
  - No 7. Optical tolerances for a segmented system (Redding)
  - No 8. Cost modeling (Targove, Kahan)
  - No 9. Comparison of sunshield implementations (Rodger Farley , Perrygo)
  - No 10. Potential orbits for NGST (Llyod Purves, Scott Benson, Michael Mesarch)
  - No 11. Sky coverage issues (A. Koratkar, P. Stockman)

GOALS FOR NEXT QUARTERLY

End to End modeling

- Peer review for the end to end model
- Improve current model
  - guider block (include pixelization, cross talk, wf errors)
  - model primary mirror actuators (LaRC)
  - improve FSM block (MSFC)
- Perform specific studies
  - DM optimization
  - RWA specification
  - compare DM vs PM correction
  - study alternate wavefront sensing (interferometer)
  - study alternate guiding system (multiple stars, roll star)
  - study alternate ACS scheme (Feeps etc..)
- Simulate entire alignment procedure (synergy with DCATT)
- Establish optimized error budget (based on the end to end model results)

GOALS FOR NEXT QUARTERLY (Ctd)

Other architecture studies

- Study impact of drift orbit (DRM, sky coverage, communications)
- Study data handling
- Perform a detailed study of the ISIM
- Continue and finalize the theoretical actuator/thermal mirror study (thin shell)

Revisit the SSM design

Note: These goals are contingent on an adequate level of technical support by NASA centers.